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ABSTRACT

This study was conducted to establish Armed Services Vocational Aptitude Battery (ASVAB) cutoff scores for the assignment of the appropriate level of the Gates-MacGinitie Reading Tests to individual Navy recruits. The Word Knowledge (WK) and Paragraph Comprehension (PC) scores were combined to provide a composite score useful as a predictor of an individual's reading grade level. Both subtests of the ASVAB measure aspects of reading ability. The Gates-MacGinitie Reading Tests, the testing procedures used in the study, and the data analysis methods employed are described. Three levels (D, E, and F) of the Gates-MacGinitie Reading Tests were used to identify accurate reading grade levels for all recruits. This method made the test an appropriate screening device for remediation programs. The ASVAB (WK+PC) ranges for assigning Gates-MacGinitie Reading Test levels are presented. The results of the iterative testing process that was used to obtain the ranges is also outlined. Recommendations are made to ensure valid reading grade levels will be obtained for all recruits. (DWH)

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TRAINING ANALYSIS AND EVALUATION GROUP

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TECHNICAL MEMORANDUM 82-4

USE OF THE ASVAB FOR ASSIGNMENT OF GATES-MACGINITIE READING TEST LEVELS

JULY 1982

FOCUS ON THE TRAINED PERSON

TM 820 796

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Technical Memorandum 82-4

USE OF THE ASVAB FOR ASSIGNMENT OF GATES-MACGINITIE READING TEST LEVELS

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July 1982

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Entering recruits, tested at the Recruit Training Command, Orlando, received either Level D, E, or F of the Gates-MacGinitie Reading Tests which are designed to test individuals with increasingly higher levels of reading proficiency. The purpose of the testing was to relate the recruits' reading ability levels to their Armed Services Vocational Aptitude Battery (ASVAB) scores from the two verbal subtests Word Knowledge and Paragraph Comprehension so that ASVAB (WK+PC) cutoff scores could be derived for

20. ABSTRACT (continued)

assigning a recruit the Gates-MacGinitie test of the appropriate difficulty level. This report suggests that administering Level D of the Gates-MacGinitie tests to all recruits does not provide an accurate classificatory scheme. Using three levels of the test will provide accurate reading grade levels for all recruits and will make the Gates-MacGinitie an appropriate screening device for remediation programs at all stages of Navy training.

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SECTION I

INTRODUCTION

Due to the Navy's increased emphasis on basic skills training and the ensuing development of a host of remediation programs, attempts are being made to develop and standardize accurate methods of assessing basic skills deficiencies. The objective is to provide enlisted personnel who are deficient in reading, language or numerical skills with appropriate remedial training. As might be expected, a major part of these efforts has been devoted to reading skills programs because of the increasing reliance on these skills in training and in the Fleet.

Several efforts have addressed the problem of remedial reading requirements at various stages of Navy training. A series of Training Analysis and Evaluation Group (TAEG) reports deal with remedial reading in recruit training (Kincaid and Curry, 1979) and remediation for recruits with English as a second language (Salas, Kincaid, and Ashcroft, 1980; Brown, 1982). One attempt to deal with the reading deficiencies of students entering "A" schools is the reading remediation portion of the Job-Oriented Basic Skills (JOBS) program. This program is designed to improve prerequisite skills essential for success in some selected class "A" schools. An interim report of the program evaluation is favorable (Baker and Huff, 1981). From these studies it is clear that the development of successful remediation programs requires accurate testing procedures for identifying remediation requirements.

One such testing procedure involves measuring of reading grade level (RGL). Because RGL predicts successful completion of recruit training (Duffy, 1976), the Navy currently measures the RGLs of all recruits to identify reading deficiencies. A reading remediation program has been developed for recruits with low RGLs. It is highly likely that RGL data will also be used with remediation programs at other stages of Navy training. For instance, in a study of 10 Navy "A" schools (Aiken, Duffy, and Nugent, 1977), RGL was predictive of successful course performance.

The Gates-MacGinitie Reading Tests (MacGinitie, 1978), currently used with the remediation program in Recruit Training to establish RGLs, can be used with remediation programs at other stages of Navy training. However, the current testing procedures must be modified in order to take full advantage of the tests' diagnostic capabilities.

The Navy has used Level D of the Gates-MacGinitie for the past 10 years to identify low level readers in Recruit Training. Recruits who do not read at the sixth grade level are placed in Academic Remedial Training (ART). Level D is given to all recruits, even though it is designed to accurately assess the reading ability of only those individuals who are reading with a proficiency at or near the 4th-6th grade level. However, the Gates-MacGinitie Reading Tests contain alternative test Levels E and F which can measure increasingly higher levels of reading ability (7th through 12th grade). Inclusion of these test levels in the current Navy testing procedures will provide valid RGLs for all recruits.

To ensure that each recruit receives the appropriate level of the Gates-MacGinitie test, a means of assigning the various levels of the test had to be developed.

The TAEG suggested to the Chief of Naval Education and Training (CNET)[1] that two subtests of the Armed Services Vocational Aptitude Battery (ASVAB), Forms 8/9/10, could be used to make such assignments. Word Knowledge (WK) and Paragraph Comprehension (PC) scores can be combined to produce a composite ASVAB score which should be a good predictor of an individual's reading level as both subtests are designed to measure aspects of reading ability. The TAEG was then tasked by the CNET to determine ASVAB (WK+PC) ranges for administration of the three levels of the test.[2]

This task was related to an earlier tasking which requested the TAEG to examine the alternative Gates-MacGinitie testing procedures in an effort to standardize measurement among a variety of contracting institutions currently administering the Navy Campus Functional Skills Program (an in-service high school completion program).[3] The results of both efforts were used by CNET to develop a policy for the consistent use of the Gates-MacGinitie Reading Tests D, E, and F throughout the Naval Education and Training Command as part of the effort to standardize fundamental skills[4] testing throughout the Navy.[5]

PURPOSE

This study established ASVAB (WK+PC) cutoff scores for appropriate assignment of Levels D, E, and F of the Gates-MacGinitie Reading Tests to individual recruits. The resulting improvement of Gates-MacGinitie testing procedures will provide accurate RGLs for all recruits, and the test will become an appropriate screening device for reading remediation programs at all stages of Navy training.

ORGANIZATION OF THE REPORT

Besides this introduction, the report contains three additional sections and an appendix. Section II describes the method of testing and the methods of data analyses used in the study. Section III reports the resulting ASVAB (WK+PC) ranges and discusses the use of the new testing procedures in Recruit Training. Section IV presents recommendations for implementing the new testing procedures.

In addition, the appendix presents a statistical formula which uses ASVAB scores WK and PC to estimate a reading test score (RGL) when testing with the Gates-MacGinitie Reading Tests is not possible.

[1]TAEG ltr of 30 July 1981.

[2]CNET ltr Code N-50 of 26 August 1981.

[3]CNET ltr Code N-53 of 13 July 1981.

[4]Some Navy activities use the term "basic skills" while others use the term "fundamental skills." The terms are synonymous.

[5]CNET ltr Code N-2 of 21 December 1981.

SECTION II

METHOD

This section describes the Gates-MacGinitie Reading Tests. the testing procedures used in the study, and the methods of analyzing the data. ASVAB (WK+PC) cutoff scores were obtained by administering designated levels of the Gates-MacGinitie Reading Tests to recruits and then relating their ASVAB scores to their reading test scores (RGLs). An iterative process was used which involved initial testing using selected ASVAB (WK+PC) ranges, adjustment of ranges and retesting with a new group of recruits. The process was continued until the ASVAB ranges that were finally obtained distinguished three groups of recruits with different levels of reading ability.

READING TEST MATERIALS

The Gates-MacGinitie Reading Test, Level D, is designed for students reading at the 4-6th grade level, Level E for those reading at the 7-9th grade level, and Level F for those reading at the 10-12th grade level. Each test has two sections, Vocabulary and Comprehension. In the past, the Comprehension section of the Level D test has been routinely administered to all recruits during the first week of Recruit Training. It is standard procedure for all recruits who score between 4.0 and 6.0 grade to be automatically referred to ART; however, each RTC can change the range to 4.0 to 7.0 when student loading in ART is light. (This is the present case in Orlando.)

TESTING PROCEDURES

Recruits from three companies (n = 233) were tested during October and November 1981 at the Recruit Training Command, Orlando.[6] In each company, the WK+PC composite ASVAB score for each recruit was computed manually and entered on the company convening rosters.[7] At the time of testing, a recruit was assigned a designated level of the Gates-MacGinitie Reading Tests based on a set of ASVAB (WK+PC) estimated cutoff scores for the use of each level. Standardized instructions for all levels of the test are identical, so all levels were administered in the same room at the same time.

The cutoff scores were chosen with the help of current descriptive data on Navy recruits which included mean ASVAB WK and PC scores and corresponding

[6]Testing was confined to RTC Orlando. Results, conclusions, and recommendations contained in subsequent sections of this report can probably be applied to the RTCs in Great Lakes and San Diego as well. Data published in the monthly CMI Recruit Population Analysis Report indicate that the relationships between RGL and ASVAB scores (WK and PC) are similar for all RTCs.

[7]It is possible to arrange for a computerized system to calculate WK+PC scores for assigning a test level to each recruit. An available system presently on-line is the Recruit Accession Module (RAM).

mean RGL scores for various groups of Navy enlisted personnel.[8] The ASVAB ranges selected initially were as follows: those recruits whose WK+PC scores were 88 or below were given Level D of the Gates-MacGinitie, those recruits whose WK+PC scores ranged from 89 to 109 were given Level E, and those recruits whose WK+PC scores were 110 or greater were given Level F.

Recruits who had ASVAB scores from Forms 5/6/7 (an older version of the battery) were given Level E, but their scores were not included in the data analyses because no PC scores were available. Subject matter experts agree, however, that WK x 2 can be used to estimate WK+PC.

The low ability group, receiving the Level D test, was expected to show low reading test scores making most recruits in that group eligible for ART. The medium ability group, receiving the Level E test, was expected to show reading test scores between 7th and 10th grade, and the high ability group, receiving the Level F test, was expected to show the highest RGLs, above 10th grade.

After the companies were tested, recruits' scores were divided into three groups according to test level. The mean RGL for each group was calculated and the RGL distribution for each group was examined. Scores from approximately 100 recruits in each group were used in the data analyses.

Because the study called for the testing of a limited number of companies and because the Navy does not often accept recruits with extremely low ASVAB scores, the number of recruits receiving the Level D test was very small. Additional data for this group were obtained from existing records of recruits who had entered Recruit Training within 6 months prior to the testing.

Results indicated that mean RGLs were higher than expected for the selected ASVAB ranges and the distributions showed a considerable overlap. ASVAB cutoff scores for each test level were lowered and new ranges were established. (The new ranges were the final ones reported in section III.) Recruits' scores were dropped from the original groups used in the data analysis if they had been assigned an inappropriate level of the test. Two additional companies (n = 157) were tested with Level E, and additional Level D test scores were obtained from records. Scores from these sources were used to replace those that had been dropped so that each group again contained about 100 scores for data analysis.[9]

Once again the mean RGL for each test group was calculated and the RGL distributions examined. At this point, the testing was discontinued because the ASVAB cutoff scores distinguished three groups with different levels of reading ability, and the average RGL for each group matched the level of the test they had received.

[8]Mean ASVAB scores WK and PC and RGL scores were obtained from the CMI Recruit Population Analysis Report, August and September 1981, produced by the Management Information and Instructional Systems Activity (MIISA).

[9]A better design would have involved testing a new sample with all three levels of the Gates-MacGinitie. In order to reduce interference with routine RTC activities, a more expedient approach was used.

SECTION III

RESULTS AND DISCUSSION

This section presents the ASVAB (WK+PC) ranges to be used for assigning recruits to Levels D, E, or F of the Gates-MacGinitie Reading Tests and presents the results of the iterative testing process that was used to obtain the ranges.

The initial ASVAB (WK+PC) ranges were adjusted after one round of testing. The adjusted ASVAB ranges shown in table 1 are those recommended for use in assigning recruits to a Gates-MacGinitie test level.

TABLE 1. ASVAB (WK+PC) RANGES FOR ASSIGNING GATES-MACGINITIE READING TEST LEVELS

ASVAB (WK+PC)	Gates-MacGinitie Test (Grade Level)
80 and below	D (4-6)
81 - 105	E (7-9)
106 and above	F (10-12)

The percentage of the total sample in each ASVAB category was then calculated. For the male companies used in this study, 4 percent were in the D range, 12.6 percent were in the E range, and 53.4 percent were in the F range. For the female company used in this study, 1.5 percent were in the D range, 25.7 percent were in the E range, and 72.8 percent were in the F range. These percentages can be used to estimate the number of recruits at RTC Orlando who will receive each level of the test when the new testing procedures are implemented, but they may not apply to the other RTCs at Great Lakes and San Diego.

Table 2 compares the reading scores of recruits administered the Gates-MacGinitie tests according to the originally selected ASVAB (WK+PC) ranges and reading scores obtained after the ranges were adjusted. The adjusted ASVAB ranges differentiated three groups of recruits with reading ability levels close to the level of test they had received.

In order to check the accuracy of prediction of the final ASVAB (WK+PC) ranges, the distribution of RGL scores within groups D, E, and F was examined.

TABLE 2. READING SCORES OF RECRUITS ASSIGNED TO GATES-MACGINITIE TEST LEVELS ACCORDING TO INITIAL AND REVISED ASVAB (WK+PC) RANGES

ASVAB (WK+PC)	Initial ASVAB Ranges			
	Test Level	Number	Mean RGL	S.D.*
88 and below	D	100	8.1**	1.9
89 - 109	E	98	10.8	1.8
110 and above	F	95	12.0	1.6
ASVAB (WK+PC)	Revised ASVAB Ranges			
	Test Level	Number***	Mean RGL	S.D.
80 and below	D	105	7.5**	1.9
81 - 105	E	100	10.1	1.8
106 and above	F	95	12.0	1.6

*S.D. = standard deviation.
**Most scores were obtained from recruit records.
***All groups contain recruits from the first testing.

Table 3 shows the distribution of reading scores in groups D, E, and F where assignment to groups was based on the adjusted ASVAB (WK+PC) ranges.

In group E, the majority of recruits had RGLs above 7.0 (94 percent) and in group F, the majority had RGLs above 10.0 (86.4 percent). With use of the recommended ASVAB ranges, the appropriate level of the Gates-MacGinitie will be assigned to each recruit.

The ASVAB range used for assigning Level D was kept high enough to allow its use in Recruit Training[10] with the consequence that obtained RGLs

[10]Approximately 5 percent of new recruits have ASVAB (WK+PC) scores designating Level D; i.e., 80 or below. Lowering the cutoff score further would have brought the percentage of recruits receiving Level D close to zero.

TABLE 3. DISTRIBUTION OF READING GRADE LEVELS (RGL) OF RECRUITS ASSIGNED TO GATES-MACGINITIE TEST LEVELS

	Test Level		
	D	E	F
ASVAB (WK+PC) Range	80 and below	81-105	106 and above
Number of Recruits	105	100	95
Percent Recruits with RGL:			
Below 7.0	40.0%	6.0%	3.2%
7.0 - 10.0	49.5	49.0	10.4
Above 10.0	10.5	45.0	86.4
	100.0%	100.0%	100.0%

in that group are higher than they should be for that test level. However, 40 percent of the recruits who were given Level D had RGL scores below 7.0 (often the cutoff for ART), while only 6 percent given Level E and 3.2 percent given Level F scored below 7.0. These figures indicate that when the new testing procedures are implemented most recruits referred to ART will have taken Level D of the Gates-MacGinitie. This will require minimal adjustment for ART where Level D is used as the entry and exit test.

CORRELATIONAL ANALYSES

As was expected, correlational analyses revealed that the ASVAB subtest scores WK and PC are good predictors of reading grade level. When RGLs of the 300 recruits in the second sample were correlated with their WK and PC scores, the Pearson Product-Moment correlations were better than those obtained from the first sample. The correlations were $r = +.70$ for WK ($p < .01$) and $r = +.67$ for PC ($p < .01$), up from $r = +.62$ for WK and $r = +.61$ for PC. These correlations can be contrasted with those obtained from a sample of 1,912 recruits who all received Level D. Correlations were $r = +.39$ for WK and $r = +.35$ for PC (Brown, 1982).

The multiple correlation ($R = + .74$) obtained in the present study suggests that WK and PC can be used in some optimal combination to estimate a reading test score (RGL) when direct testing of reading ability cannot be done. (See the appendix for a formula which will obtain the estimation.)

SECTION V

RECOMMENDATIONS

The following recommendations are presented to ensure that valid reading grade levels are obtained for all recruits. The new testing procedures will make the Gates-MacGinitie Reading Test an accurate assessment tool and an effective screening device for reading remediation at all stages of Navy training.

- Administer Levels D, E, and F of the Gates-MacGinitie to all recruits entering Recruit Training, using the ASVAB (WK+PC) ranges obtained in this study to assign an appropriate level to each recruit.

- For those recruits with ASVAB scores from Forms 5/6/7, there will be no PC score available. Use WK x 2 to assign a recruit a level of the test.

- Use the computer management system RAM (Recruit Accession Module, 1981) to calculate WK+PC scores so that the appropriate test level for each recruit will appear on the RTC company convening rosters.[11]

- Use RGL scores obtained from the Gates-MacGinitie Reading Tests in all Navy programs related to basic skills training, especially those involved with reading remediation.

POST NOTE

Since completion of the study reported here, the Chief of Naval Technical Training (CNTECHTRA) promulgated an instruction (CNTECHTRAINST 1540.42B, 13 May 1982) for implementing the reading testing procedures recommended in this report. Ranges of WK + PC, as determined by this study, have been programmed into the Recruit Accession Module computer system. All recruits will receive the appropriate level of the Gates-MacGinitie Reading Tests. This grade level will be recorded on a Reading Grade Level Documentation sheet (CNTECHTRA-GEN 1540/30) and placed in the personnel record (to be removed when the service member receives his/her first assignment outside of the training command).

[11]MIISA prints the rosters using information obtained from RAM.

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APPENDIX

THE USE OF ASVAB SCORES WK AND PC TO PREDICT GATES-MACGINITIE READING TEST SCORES (RGL)

In order to obtain a formula that accurately predicts RGL from WK and PC scores, a forward stepwise multiple regression analysis[12] was performed. The predictor equation that was obtained and that accounts for 55 percent of the variance of RGL is:

$$RGL = .13\ (WK) + .09\ (PC) - .61.$$

A summary table showing the multiple Rs and cumulative percentage of RGL variance explained as each variable (WK, PC) was entered into the regression equation is presented in table A-1.

TABLE A-1. MULTIPLE REGRESSION SUMMARY TABLE

Predictor Variable	Multiple R	Cumulative Percentage of Variance Explained
WK	.70	.49
WK + PC	.74	.55

The formula can be used to estimate:

- an individual's Gates-MacGinitie test score (RGL) when testing is impossible[13]
- a group's mean RGL by using the group's WK and PC scores
- the RGL requirement of a class or school when WK and PC requirements are known.

The formula is useful to other branches of the armed services which do not routinely administer the Gates-MacGinitie Reading Tests to all service personnel.

[12]This is a commonly used SPSS statistical procedure from Nie, Hull, Jenkins, Steinbrenner, and Bent (1975).

[13]It is better to use the test score whenever possible because the formula is not a perfectly accurate predictor.

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